AS 500 straight web sections

AS 500 straight web sheet piles are designed to form closed cylindrical structures retaining a soil fill. The stability of the cells consisting of a steel envelope and an internal body of soil is guaranteed by their own weight. Straight web sheet piles are mostly used on projects where rock layers are close to ground level or where anchoring would be difficult or impossible. Straight web sheet pile structures are made of circular cells or diaphragm cells, depending on the site characteristics or the particular requirements of the project. The forces developing in these sheet pile sections are essentially horizontal tensile forces requiring an interlock strength corresponding to the horizontal force in the web of the pile. AS 500 interlocks comply with EN 10248. **Please refer to our brochure "AS 500 Straight web steel sheet piles - design & execution manual" for further details.**

Section	Nominal width[1]	Web thickness	Deviation angle[2]	Perimeter	Steel section	Mass	Mass per m² of wall	Moment of inertia	Section modulus	Coating area[3]
	b	t	δ	(single pile)				(single pile)		
	mm	mm	°	cm	cm²	kg/m	kg/m²	cm⁴	cm³	m²/m
AS 500-9.5	500	9.5	4.5	138	81.3	63.8	**128**	168	46	0.58
AS 500-11.0	500	11.0	4.5	139	90.0	70.6	**141**	186	49	0.58
AS 500-12.0	500	12.0	4.5	139	94.6	74.3	**149**	196	51	0.58
AS 500-12.5	500	12.5	4.5	139	97.2	76.3	**153**	201	51	0.58
AS 500-12.7	500	12.7	4.5	139	98.2	77.1	**154**	204	51	0.58

[1] The effective width to be taken into account for design purposes (lay-out) is 503 mm for all AS 500 sheet piles.
[2] Max. deviation angle 4.0° for pile length > 20 m.
[3] One side, excluding inside of interlocks.

General cargo berth, Bal Haf, Yemen

The following interlock strengths can be achieved for an S 355 GP steel grade:

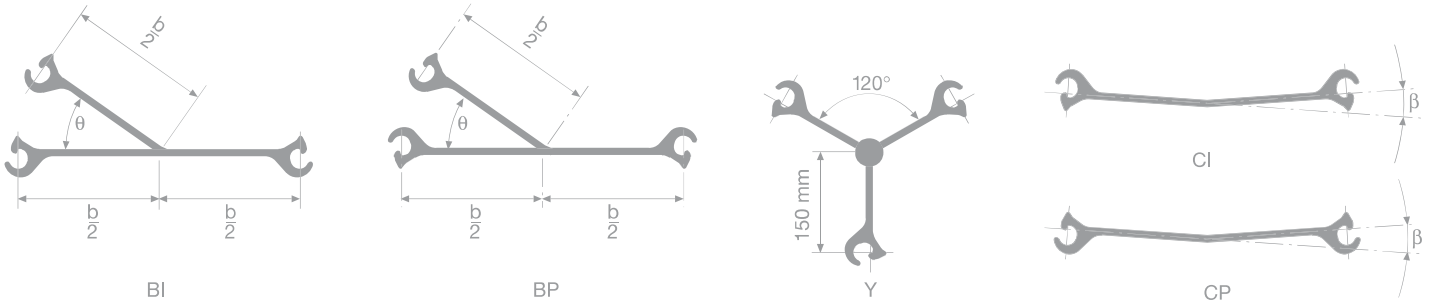
Section	F_{max} [kN/m]
AS 500-9.5	3000
AS 500-11.0	3500
AS 500-12.0	5000
AS 500-12.5	5500
AS 500-12.7	5500

For verification of the strength of piles, both yielding of the web and failure of the interlock should be considered.

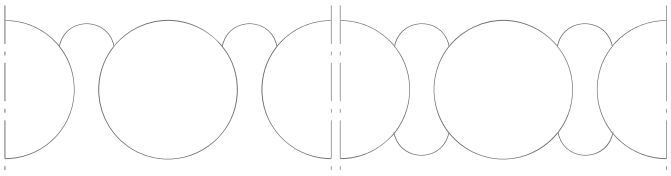
Bridge construction, South Korea

Junction piles and bent piles

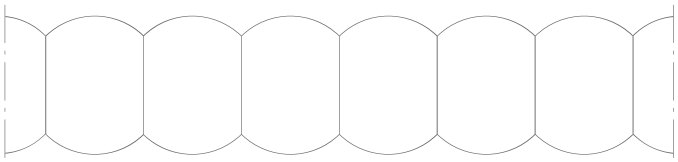
Junction piles that join circular cells and intermediary arcs can be provided. Bent piles are pre-bent at the mill. If the deviation angle exceeds 4.5° (4.0° if L > 20 m), bent piles can be used to set up structures with small radii.



Types of cells



Circular cells with 35° junction piles and one or two connecting arcs.



Diaphragm cells with 120° junction piles.

Berthing facility, Canada

Lock, Arkansas, USA

Circular cell construction

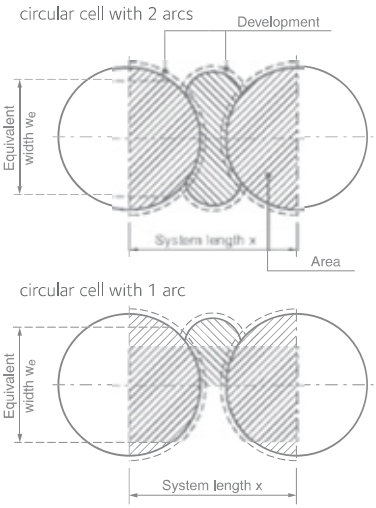
1. Installation of template

2. Threading until cell closure

3. Driving

Equivalent width

The equivalent width w_e which is required for stability verification determines the geometry of the chosen cellular construction.



• for circular cells

The equivalent width w_e is defined as:

$$w_e = \frac{\text{Area within 1 cell + Area within 1 (or 2) arc(s)}}{\text{System length x}}$$

The ratio R_a indicates how economical the chosen circular cell will be.

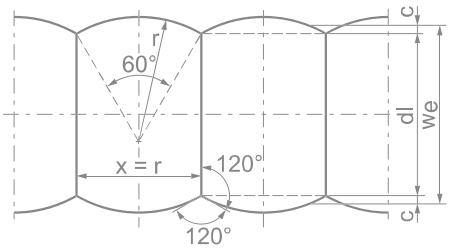
It is defined as follows

$$R_a = \frac{\text{Development 1 cell + Development 1 (or 2) arc(s)}}{\text{System length x}}$$

• for diaphragm cells

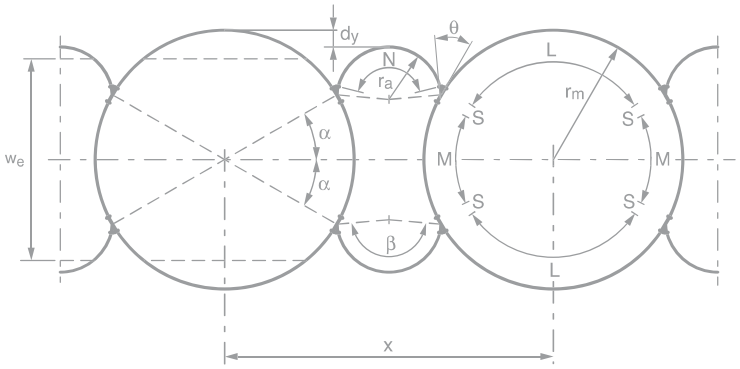
The equivalent width w_e is defined as:

w_e = diaphragm wall length (dl) + 2 · c

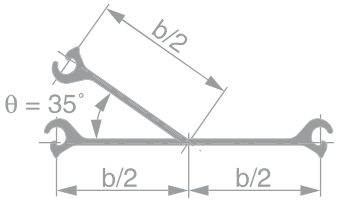


Geometry of circular cells

Once the equivalent width has been determined, the geometry of the cells can be defined. This can be done with the help of tables or with computer programs.



Standard solution



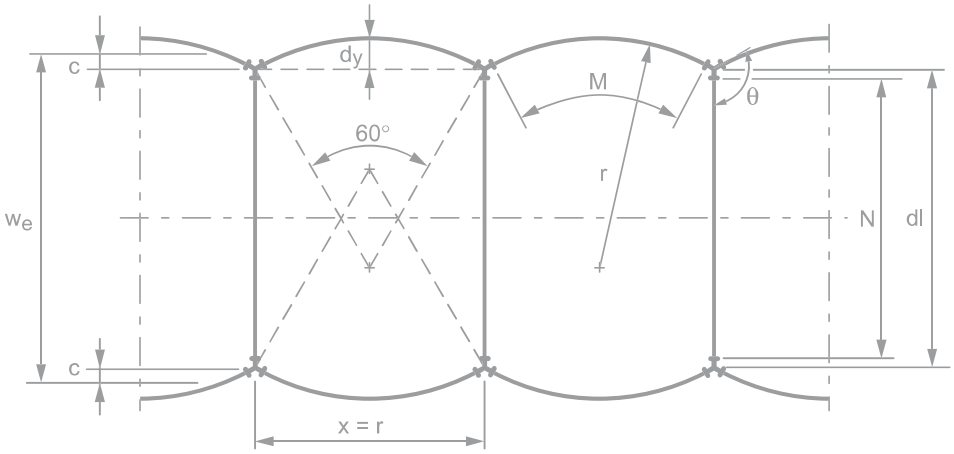
r_m = radius of the main cell
r_a = radius of the connecting arcs
θ = angle between the main cell and the connecting arc
x = system length
d_y = positive or negative offset between the connecting arcs and the tangent planes of the main cells
w_e = equivalent width

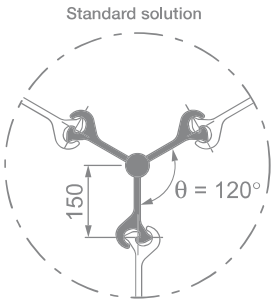
Junction piles with angles θ between 30° and 45°, as well as θ = 90°, are available on request.

The table below shows a short selection of circular cells with 2 arcs and standard junction piles with θ = 35°.

Nb. of piles per						Geometrical values						Interlock deviation		Design values
Cell				Arc	System							Cell	Arc	2 Arcs
Total pcs.	L pcs.	M pcs.	S pcs.	N pcs.	pcs.	d = 2·r_m m	r_a m	x m	d_y m	α °	β °	δ_m °	δ_a °	w_e m	R_a
100	33	15	1	25	150	16.01	4.47	22.92	0.16	28.80	167.60	3.60	6.45	13.69	3.34
104	35	15	1	27	158	16.65	4.88	24.42	0.20	27.69	165.38	3.46	5.91	14.14	3.30
108	37	15	1	27	162	17.29	4.94	25.23	0.54	26.67	163.33	3.33	5.83	14.41	3.27
112	37	17	1	27	166	17.93	4.81	25.25	0.33	28.93	167.86	3.21	6.00	15.25	3.35
116	37	19	1	27	170	18.57	4.69	25.27	0.13	31.03	172.07	3.10	6.15	16.08	3.42
120	39	19	1	29	178	19.21	5.08	26.77	0.16	30.00	170.00	3.00	5.67	16.54	3.38
124	41	19	1	29	182	19.85	5.14	27.59	0.50	29.03	168.06	2.90	5.60	16.82	3.35
128	43	19	1	31	190	20.49	5.55	29.09	0.53	28.13	166.25	2.81	5.20	17.27	3.32
132	43	21	1	31	194	21.13	5.42	29.11	0.33	30.00	170.00	2.73	5.31	18.10	3.39
136	45	21	1	33	202	21.77	5.82	30.61	0.36	29.12	168.24	2.65	4.95	18.56	3.35
140	45	23	1	33	206	22.42	5.71	30.62	0.17	30.86	171.71	2.57	5.05	19.39	3.42
144	47	23	1	33	210	23.06	5.76	31.45	0.50	30.00	170.00	2.50	5.00	19.67	3.39
148	47	25	1	35	218	23.70	5.99	32.13	0.00	31.62	173.24	2.43	4.81	20.67	3.44
152	49	25	1	35	222	21.31	6.05	32.97	0.31	30.79	171.58	2.37	1.77	20.95	3.12

Geometry of diaphragm cells





r = radius
θ = angle between the arc and the diaphragm
w_e = equivalent width, with $w_e = dl+2 \cdot c$
d_y = arc height
dl = diaphragm wall length
x = system length
c = equivalent arc height


Tugboat berth, Panama Canal, Panama


Marina breakwater, Costa Rica

Geometry diaphragm wall

Number of piles	Wall length
N pcs.	dl m
11	5.83
13	6.84
15	7.85
17	8.85
19	9.86
21	10.86
23	11.87
25	12.88
27	13.88
29	14.89
31	15.89
33	16.90
35	17.91
37	18.91
39	19.92
41	20.92
43	21.93
45	22.94
47	23.94
49	24.95
51	25.95
53	26.96
55	27.97
57	28.97
59	29.98

Geometry arc (Standard solution)

Number of piles	Radius System length	Arc height	Equivalent arc height	Interlock deviation
M pcs.	x=r m	d_y m	c m	δ_a °
11	5.57	0.75	0.51	5.17
13	6.53	0.87	0.59	4.41
15	7.49	1.00	0.68	3.85
17	8.45	1.13	0.77	3.41
19	9.41	1.26	0.86	3.06
21	10.37	1.39	0.94	2.78
23	11.33	1.52	1.03	2.54
25	12.29	1.65	1.12	2.34
27	13.26	1.78	1.20	2.17
29	14.22	1.90	1.29	2.03
31	15.18	2.03	1.38	1.90
33	16.14	2.16	1.46	1.79
35	17.10	2.29	1.55	1.69
37	18.06	2.42	1.64	1.60
39	19.02	2.55	1.73	1.52
41	19.98	2.68	1.81	1.44
43	20.94	2.81	1.90	1.38